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ODC 815.4245.13 : 516.2 : 176.1 *Betula alleghaniensis* Britton

EFFECTS OF PRUNING HEIGHT ON THE DIAMETER GROWTH OF YELLOW BIRCH

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Abstract.—The diameter growth rate of pruned trees increased the second year after pruning, whereas the diameter growth of unpruned trees was not as fast during the second year. Diameter growth rate was positively correlated with the height to which all branches were pruned. After the pruning shock of the first year, trees pruned to 50 percent of their height showed the greatest cumulative growth in diameter.

One cultural method used to meet the increased need for quality hardwoods, especially birch (*Betula alleghaniensis* Britton), is to prune young trees as early as possible to insure maximum growth of clear wood in the shortest period without reducing diameter growth. The removal of branches while they are small eliminates branch stubs and reduces the surface area available for the entrance of organisms that can cause discoloration. Rapid diameter growth also reduces the time a wound remains open. The objective of this study was to determine the effect of various degrees of pruning on growth in diameter.

In 1963, twenty 13-year-old dominant and codominant yellow birch trees on the Bartlett Experimental Forest in Bartlett, New Hampshire, were divided into four groups, five trees per group. The mean height and diameter of the trees were 7.62 m and 4.42 cm, respectively. Of the four groups, one was unpruned; the other three were pruned of all branches up to 50, 65, or 75 percent of total tree height.

Radial growth was measured weekly to the nearest 0.025 mm with a dial-gage dendrometer at 1.37 m above ground. The use and accuracy of the dial-gage dendrometer have been described previously (*Blum 1966; Blum and Solomon 1966*).

Growth Differences

An analysis of variance of the cumulative growth in diameter was used to test for differences between treatments. The data were transformed to the logarithm of final diameter divided by initial diameter in order to make amounts of growth comparable, regardless of tree size. When data for two growing seasons were averaged, there were no differences between groups in diameter growth significant at the 5 percent level. However, when the cumulative diameter growth was plotted on an annual basis, there were differences in diameter growth between unpruned trees and trees pruned to 75 percent for the first growing season, and between unpruned trees and trees pruned to 50 percent of their total height for the second growing season (fig. 1 and 2).

Figure 1.—Cumulative diameter growth of pruned and control trees during the first growing season.

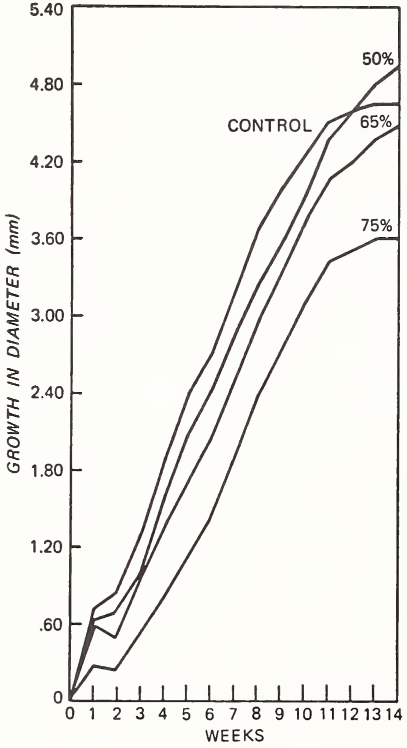
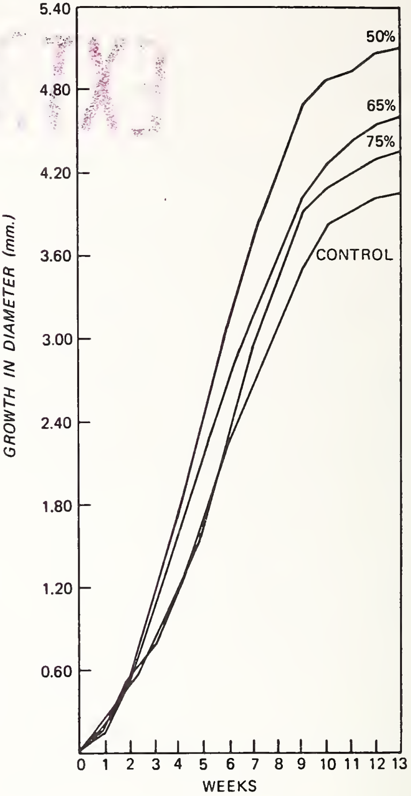


Figure 2.—Cumulative diameter growth of pruned and control trees during the second growing season.



In the first growing season after pruning, unpruned trees showed the fastest diameter growth. The growth rates of the treated groups of trees were lower where the intensity of pruning was higher. Trees pruned to 65 and 75 percent of their height showed a definite decline in growth for the first growing season, compared with control trees, indicating that some of the crown needed for growth had been removed. This detrimental effect on growth at the end of the first growing season had been overcome by the end of the second growing season.

In the second growing season, unpruned trees showed a very small reduction in growth rate, with a lower growth peak than in the first growing season. Pruned trees had faster growth rates and greater cumulative growth in the second growing season than in the first growing season. Trees pruned to 75 percent showed the greatest reduction in growth rate during the first growing season after pruning, perhaps because more of the crown was removed. During the second growing season, these trees showed the greatest increase in growth rate, but did not attain the overall cumulative growth of trees pruned to 50 and 65 percent.

The increased cumulative growth of trees pruned to 50 percent of their height is similar to the response of pruned black walnut *(Clark 1955)*. Although a faster growth rate was found for yellow birch trees pruned to 75 percent, the greatest increase in diameter over 2 years was found in trees that had been pruned to 50 percent. The results indicate that the diameter growth of pruned trees is better than that of unpruned trees after the first year. Such a result can be accomplished by keeping the crown length slightly greater than 50 percent of the total tree height. Pruning yellow birch once may not have an appreciable influence on subsequent tree growth *(Skilling 1959)*.

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